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THE VETERINARY JOURNAL

A Monthly Review of Veterinary Science.

Editor:
FREDERICK HOBDAY, C.M.G., F.R.C.V.S., F.R.S.E.,
HONORARY VETERINARY SURGEON TO HIS MAJESTY THE KING.
MAJOR IN THE ARMY VETERINARY CORPS.
HONORARY MEMBER OF AMERICAN VETERINARY MEDICAL ASSOCIATION.
CORRESPONDANT ÉTRANGER DE LA SOCIÉTÉ DE MÉDECINE VÉTÉRINAIRE DU BRABANT (BELGIUM)

Sub-Editor:
GLADSTONE MAYALL, M.R.C.V.S.

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GLADSTONE MAYALL, M.R.C.V.S.

DECEMBER, 1918.

Editorials.

MILK-BORNE DISEASES.

THESE diseases are interesting to us from the point of view of tracing their origin, and it is well to bear in mind the human complaints that may be spread by milk. The list comprises typhoid and paratyphoid fever, diphtheria, septic sore throat, scarlet fever, tuberculosis and cholera. Milk supply may be suspected where a large number of cases occur at the same time in families receiving milk from a certain common source ; the disease may be of a mild type and the mortality low ; women and children may be chiefly affected, because drinking the most milk. Where official action is followed by a quick drop in the number of new cases of disease it is pretty good evidence that the source of the disease has been discovered. There is reason to believe that the cow may occasionally be the originator of one of these human ailments, viz., septic sore throat. It can hardly be expected that milk from cows with streptococcic mammitis can be consumed by human beings without a chance of sore throat arising, and there must be some danger to children, and even adults, too, from consuming a supply from cows with discharges from the womb or vagina, internal disorders, or sores on the teats or udder. Perhaps typhoid fever is the most frequent of the milk-borne diseases, and water, flies, dust, and chronic bacilli carriers (human beings that have suffered from typhoid) are sources of infection. The spread of diphtheria by milk occurs less frequently than that of typhoid fever, but several cases of the kind have been recorded. The milk is not changed in appearance by the

presence of the diphtheria bacillus, but a comparatively low degree of heat (140° F.) is sufficient to kill the organism.

In another part of this issue we publish a very interesting account of the transmission of diphtheria by cows' milk, and it is noteworthy that in this connection Mr. G. Gair, M.R.C.V.S., the writer of the article, incriminates flies as a cause of the outbreak. The fly as a spreader of disease is receiving far more attention than formerly. There is reason to believe, as not a few observers have recently indicated, that *Musca domestica* is a factor in the spread of mammitis from cow to cow. The insect is quickly gaining the reputation of a veritable wolf in sheep's clothing. Mr. Gair's ways of dealing with the infected milk and the sewage tank are worth remembering. G. M.

NECRO-BACILLOSIS.

WE print in another column a very interesting communication on "Gangrenous or Necrotic Dermatitis" in the donkey transport in German East Africa.

This disease has caused serious losses in all theatres of the war, and especially on the Flanders Front in the winters of 1915–16 and 1916–17.

The malady in question—necro-bacillosis—generally makes its appearance with suddenness, and the lesions when once established are of such a type as not only to incapacitate by a long surgical disability, but also to threaten a fatal issue unless energetically and appropriately handled.

Excessive and rapidly developed lameness leads to the detection, on examination, of a ragged, unhealthy-looking sore, generally at the hoof-head, and apparently the result of a "tread" or injury inflicted by the shoe. The heel is sometimes the site of the primary lesion, but more frequently the trouble starts at the coronary band, and rapidly develops into a spreading gangrenous lesion discharging a thin, offensive fluid, and threatening to involve the deeper structures—a sequel which invariably follows surgical neglect. Lameness is excessive, constitutional symptoms run high, and a fatal termination is the early and frequent result unless energetic treatment is directed to the lesion and the cause—a microbic invasion by an organism of the anærobic type, which is present in the organic mud of the kraal or standings or the roads in its near vicinity. Wet weather—which connotes mud—is generally associated with the disease, as is the presence in the mud of a high percentage of organic (fæcal) matter. The presence of an abrasion seems essential to the lodgment of the microbe.

The fact that this organism is an anærobe suggests the first principle of treatment, viz., free exposure of underrun parts and vigorous

surgical measures to arrest spread, by the removal of necrotic centres of re-infection.

Following this procedure, the frequent placing of the foot in a bucket of hot permanganate solution for a short time, and the subsequent application to the lesion of firmly applied antiseptic dressings, will lead to a convalescence, the length of which will depend upon the extent of tissue involved.

Captain Henderson has found the use of pure oil of turpentine an effective dressing, promoting granulation and acting as a powerful and penetrating germicide. This treatment recommends itself on the grounds of simplicity and efficiency, and might well take the place of, or be used in conjunction with, the system of hot lavage with potassium permanganate.

If necrosis of the coronary band has occurred to such an extent as to involve the future integrity of the wall of the hoof, the question of the expediency of attempting treatment may arise.

The outbreak may assume serious dimensions before the state of infection of the ground, and the consequent necessity for precautionary measures, is recognised. Routine washing of the feet of such animals, or the passage through a shallow foot-bath containing a solution of sulphate of copper, will be found to control the tendency to the disease.

The chief points to be recognised appear to be the liability to infection in foul ground, and the necessity of an initial, prompt and energetic oxidising treatment. M.

Original Communications.

GANGRENOUS DERMATITIS.

By Captain W. W. HENDERSON.
Veterinary Officer, Port Amelia.

From the return it will be observed that a total of 68 donkeys treated were exhibiting a condition which I have termed Gangrenous Dermatitis.

This condition has proved very refractory to cure, and has caused considerable inconvenience to the Units concerned. More especially has this been the case with the donkeys of the Animal Transport, L. of C., where at one time 30 per cent. of their total strength were under treatment and incapacitated from duty.

The disease, as it almost invariably presents itself, is localised to the skin and underlying tissue in the region of the heel and coronary band, but from the original site, if not treated early and energetically,

spreads rapidly in all directions and invades the deeply-lying structures, tendons, ligaments, and even bones.

Unfortunately in most cases, more especially in donkeys, where the difficulties of detecting the lesion in its initial stages are great, the disease may be in existence for a day or two, and there is marked lameness when the animals are brought in for treatment.

The local lesion is a necrotic gangrenous wound of variable size, met with usually in the region of the heel; there is a very persistent foul-smelling purulent discharge of a greyish colour, in which may be found small particles of dead tissue.

The edges of the wound are rugged, not well defined, and of a necrotic character.

The gangrenous necrosis spreads with alarming rapidity, and within 24 hours of first being noticed the wound may have doubled its circumference and burrowed so deeply that certain important underlying structures have become involved, such as tendon and tendon-sheaths, with a corresponding increase of pain and a corresponding decrease in the prospects of an ultimate recovery.

In fact, when once the necrotic process has invaded the tendon-sheaths or other underlying structures, destruction is the only course indicated.

Treatment.—The necrosis and gangrene must be arrested and the adjacent and still healthy tissue encouraged to throw off the attached gangrenous slough

For this purpose I have found the application of pure turpentine to the wound and the removal of all loose tissue to have a most marked effect.

The turpentine is not only a strong penetrating antiseptic, but has a decidedly stimulating action on the adjacent healthy tissue, causing a well-marked leucocytosis and, in favourable cases, within 48 hours, sloughing of the dead tissue leaving a healthy granulating surface underneath.

As soon as the slough has separated and granulations well advanced, there is no danger of a further extension of the necrosis, and the healing process goes on uninterruptedly.

In conjunction with the above I use the following liniment soaked in cotton wool and bandaged to the part :—

Ol. Tereb.	oz. ii	applied twice daily.
Zinc Oxid.		
Boric Acid a a	oz. ii	
Tar or Disinfectant Fluid ..	oz. i	
Ol. Lini. ad.	oz. xxiv	

This application has the effect of encouraging healthy granulations and rapid recovery.

The mortality from this condition has been rather high in donkeys, firstly, from the usually advanced state of the necrosis before treatment is commenced, and, secondly, owing to the donkey propensity for licking and eating wounds great difficulty is experienced in keeping the parts bandaged and the wounds free from flies.

This treatment has given quite satisfactory results, and certainly is superior to other forms I have tried in the past.

ABOUT HÆMATOZOA AND THEIR INTERMEDIARY "CARRIERS" OR "BEARERS."

By THOS. B. GOODALL, F.R.C.V.S., F.L.S.,
Christchurch, Hants.

It is now universally admitted that the various forms of blood-parasites, each inducing a specific disease in the infected "host," cannot be transmitted direct from one host to another, but are dependent upon an intermediary carrier for their transference; and the first duty of those called upon to deal with these diseases is, after finding the causal organism in the blood, to ascertain, if possible, what is the "carrier." So far this has always been found to be some creature that lives on the blood of the host, such creatures as ticks, fleas, lice, blood-sucking flies, and possibly some acarina.

In some of these the bearers are necessary for the sexual cycle of the parasite, as, for example, the strange life-history of the malaria parasite.

In others the organism is transmitted by direct inoculation, such as the Trypanosome of Ngana disease by a Tsetse-fly, and so it behoves us to devote even more and more attention to the habits, life-histories, and *the natural enemies* of all creatures that are parasitic on man and the hig her animals, if we would deal successfully in the suppression of diseases induced by hæmatozoa.

Until quite recently comparatively few entomologists have taken up seriously a study of the Diptera, and those have received little or no encouragement from the State.

In 1891 Mr. F. V. Theobald commenced the publication, in one shilling parts, of his great work, "An Account of British Flies," but after the issue of the first six parts he wrote to his subscribers, of whom I had the honour to be one, that he had already lost so much money on the venture that he did not feel justified in going on with it. Since then, I am glad to say that a part, at least, of his work, a Monograph of the Culicidæ, has been published by the Trustees of the British Museum, and is now probably the standard work on the subject.

Where hundreds have devoted themselves to a study of the Coleoptera or Lepidoptera, very few indeed have been attracted by Diptera.

What makes a knowledge of blood-sucking flies of importance is their association with disease in man and the higher animals.

The great discovery by Ross in 1897 that the malarial parasite passed its sexual cycle in the body of Anopheles, and a little later the splendid work of Col. Bruce, proving that the Trypanosomes causing the deadly Ngana disease of horses and cattle were conveyed from tolerant big game animals to imported domestic animals by a Tsetse-fly, gave a great stimulus to a more careful study of the Diptera, and I do not think it will be out of place to give a short summary of the events that led up to this.

The causal organism of malaria was first discovered by Laveran, a French army surgeon serving in Algeria, in 1880.

In 1885 Italian pathologists came round to Laveran's views, and showed that the periodic attacks of fever in malarial patients corresponded with the development of the organisms.

An old popular belief had long before this connected mosquitoes with malaria.

In 1894 Manson, arguing from analogy of his own discovery of the part played by mosquitoes as carriers of filariasis, suggested a similar intermediate host.

In 1895 Ross, following up this line of investigation, found that if a mosquito sucked blood containing the parasites they soon began to throw out flagellæ, etc.

In 1897 he followed out the life-history of the malarial parasites of birds, and showed that certain peculiar pigmented cells, which he had found in the stomach walls of mosquitoes, were parasites of æstro-autumnal malaria in an early stage. He saw them through all their stages in the mosquito and the bird.

To apply these discoveries to the malaria of man was an obvious step.

In 1898–1899 and 1900 interesting experiments were carried out showing that persons protected from the bites of mosquitoes in notoriously malarial regions escaped, while others—exposed—contracted the disease

The life-cycle of the parasite was first discovered by Ross, and it was he who pointed out that it was only in the body of the Anopheles that it could develop.

It passes through a sexual cycle in the body of the mosquito and an a sexual cycle in the blood of man. They occupy and destroy the red corpuscles.

The number in the blood in an acute attack is reckoned by Ross to be not less than 250 millions.

To show the great stimulus given to the study of the Diptera by

these discoveries I will state briefly how rapidly the numbers of known and described Culicidæ have increased during the last few years.

In Westwood's "Modern Classification of Insects," published in 1840, only *six* genera of the Culicidæ had been then characterised, and three of these were British p. [512].

He mentions (p. 507) the gnat of Lapland (so graphically described in Alfred Russell Wallace's "World of Life") as the true *Culex pipieus*. (He mentions Anopheles. (p. 508).

The musquito, moustique, or marinqouin, which appears to be a species of this family (Culicidæ), is far more annoying in its attacks upon the inhabitants of America and India than our European species is to us, etc.

He quotes from Herodotus that the ancient Egyptians guarded themselves against gnats, and also the ancient Greeks, by the use of nets.

In Kirby's "Text-book of Entomology," published in 1885, only one short sentence is devoted to the Culicidæ, as "too well known all over the world as gnats and mosquitoes."

But when we come to Stephens' and Christopher's Practical Study of Malaria," published in 1904, we have 25 genera of Culicidæ, with something over 200 species. and 12 genera of Anophelindæ with 80 species.

And when I take up this latest book, "Mosquitoes and their Relation to Disease," by F. N. Edwards, published in 1916 by the Trustees of the British Museum, I note that he says: "There are, in reality, about a thousand different kinds of mosquitoes known, and they inhabit every country of the world. In Britain we have no fewer than eighteen kinds."

There are about one hundred known species of Anopheles.

From Stephens' and Christopher's "The Practical Study of Malaria."

Among the groups into which the Protozoa are divided we find such well-known classes as the Sarkodina, of which Amœba coli is an example; the Mastigophora, possessing flagellæ, as the Trypanosomes, of which there are a great many, and the Sporozoa.

The Sporozoa include such orders as the Gregarines and the Hæmosporidia, which include the malaria parasite of man, and blood-parasites of birds. (It also includes the blood-parasites of cattle, dogs, horses, etc.)

There are many forms of filaria carried by gnats.

Organisms causing plague are carried by the rat and its flea.

My friend Dr. A. C. Coles, of Bournemouth, one of the most patient and persevering microscopists of the day, has recently demonstrated a Spirochæte in the kidney of the rat, which is the causal organism of

epidemic jaundice, and now the riddle will be how to find the intermediary bearer between rat and man.

Their Mode of Warfare.

Pathogenic organisms do not always destroy directly, though the malaria parasites, and the Trypanosomes destroy the red corpuscles of the blood.

But others produce their deadly effects by giving off poisons or toxins.

Besides these toxins Metchnikoff demonstrated that certain of the Leucocytes have the power of absorbing and digesting foreign invaders ; to these he gave the name of Phagocytes. They are always patrolling the blood current, ever on the watch for intruders.

The use of poison gases in modern warfare is but a crude imitation of what has been going on in the incessant struggle for existence in animal bodies, which may be regarded, in this sense, as huge empires, through all time.

An enemy in the form of a blood-parasite invades the body or empire and gives off a toxin, which, if not dealt with promptly, means death. To meet this, certain guardian cells (the leucocytes) have the power of emitting a counter-poison, or anti-toxin, which neutralises the original ; and so the warfare proceeds until one side or the other is victorious.

Modern research seeks to find out what are the anti-toxins of the organisms producing specific diseases, which are then made artificially and injected into the blood or tissues of the patient, and so helping and stimulating the anti-toxins to resist the invasion.

In this warfare it is not a question of conscription or voluntary service, but every unit of the empire continues to resist the invaders. Thousands—millions—may perish, but others take their place without thought of self.

Animals and man in their natural environments sometimes become tolerant, and then act as reservoir hosts.

Here is a short extract from Sir E. Ray Lankester's " Advance of Science " :—

" The wild creatures, brought into a condition of ' tolerance ' by natural selection, and the dying out of those susceptible to the poison, form a sort of ' reservoir ' of deadly Trypanosomes for the Tsetse-flies to carry into the blood of newcomers. The same phenomenon of ' reservoir ' has been observed in the case of malaria ; the children of the native blacks in Africa and in other malarious regions are tolerant of the malarial parasite, as many as 80 per cent. of children

under ten being found to be infected, and yet not suffering from the poison.

"How great is the contentment of those who have long worked at apparently useless branches of Science in the belief that all knowledge is good, to find that the Science they have cultivated has become suddenly and urgently of the highest possible value."

We have already alluded to the danger of introducing fresh stock or men into countries where there are tolerant hosts, for the blood-parasites of these reservoir hosts are introduced into their blood with fatal results.

But surely the danger is ten-fold when a few tolerant men or animals or "reservoir" hosts are brought into direct contact with clean or fresh men or animals.

For it seems to me not only possible, but highly probable, that when a bearer of disease inducing organisms, himself tolerant to their presence, is transferred from a country where they are rife to another country and environment, not only gnats and mosquitoes, but any blood-sucking flies, furnished as they are with such perfect inoculating instruments, may transmit sufficient of his infected blood to the body of another man to induce in him a serious disease.

This war will add much to our knowledge of the real factors in the spread of disease, for sick and wounded men coming from all over the world are being transported to new environments, many of them, most probably, carriers of hæmatozoa in one form or another, themselves tolerant; and one such man, being exposed to the bites of flies, might well be a centre for a big population being the victims of some so-called new disease—so we see the importance of a knowledge of the subject.

Though the malarial parasite, as proved by Ross, passes its sexual stages in the body of Anopheles, it may pass many asexual stages in the blood of man; and besides these parasites there are the others I have mentioned—Trypanosomes, Filariæ, etc, and I adhere to what I have maintained for years, since the seventies, when I first took up the subject, that it is possible for any blood-sucking fly to carry these organisms from host to host. *If they did not often* do it in their own country and environment they might in a new country and new environments.

Our Government, I believe, are awakening to the fact that we might be threatened by such an invasion, and are making enquiries about the localities in which gnats and mosquitoes may be found in more or less abundance.

As an illustration of the manner in which blood-parasites might be carried by tolerant hosts to other countries, let us think of the remarkable life-history of the *Gastrophilus equi*. I have found a mature fly

of the English *Gastrophilus* in South Africa, and from a "hot" pupa from an American horse at our barracks in 1915 I reared the mature American fly.

Knowing, as we do now, that piroplasma are carried through all the stages in the life of a tick, I suggest the possibility that even the generally considered harmless *Gastrophilus* might be an intermediary carrier of hæmatozoa. I will go further, and say that, in our present state of knowledge, all parasites, external and internal, should be looked upon with suspicion as possible "carriers."

Only last year the body-louse was proved to be the intermediary bearer of the causal agent of trench-fever.

We sometimes hear men speaking of a *new* disease. There is no such thing; the micro-organisms inducing the state of our bodies we term disease have been in existence through œons of time, probably long before man made his appearance on earth, and they have lived and multiplied in their normal element and environment, which is the blood of higher animals, but we have only lately perfected the means of discovering them.

But they could never have been transported from one host to another by any inherent quality of their own, and so, from the very beginning, flies and other agents that derived their nourishment from the blood of animals evolved organs, it would seem, specially adapted for the purpose.

Before the advent of man, the balance of life was maintained, probably smoothly; if there was a superabundance of one form it was checked by another, and the equilibrium was maintained.

But when man introduced civilisation and took himself and imported his flocks of sheep, herds of cattle, and his artificially bred horses into new countries, the Tsetse-fly, the tick, and the mosquitoes conveyed the organisms from the natives and the native fauna to himself and his flocks and herds with disastrous results.

The principal carriers of these parasites from host to host are believed to be gnats and mosquitoes and ticks, though we must bear in mind that other parasites must be regarded with suspicion.

And they are not only dangerous in this respect; for the Culicidæ do not feed on blood alone—indeed many of them never get the chance (I have reared two generations of the *Dixa* in a glass jar containing sewage water, from which they never came out), but they feed on putrefactive matters found in such substances, and you may fancy a gnat enjoying such a feast being disturbed by a man or boy—it leaves the filth for a more bountiful and enjoyable feast on his blood, and introduces its filth-covered mouth-organs into the circulation of its disturber with dire consequences—real blood-poisoning.

Some two or three years ago my own little grandchild was bitten by a gnat on the eyelid, which led to such grave symptoms that fears were entertained that he might lose the eye.

The mouth-organs of the blood-sucking flies are perfect inoculating instruments.

The terms gnats and mosquitoes are synonymous and interchangeable, like apes and monkeys, for, in a sense, a gnat is a mosquito and a mosquito is a gnat.

They belong to the family Culicidæ, which contains several genera and a large number of species.

The term "mosquito" means originally, in the Spanish, a "little fly," and has been applied in different parts of the world to many different species, though now, amongst pathologists, it is generally agreed that when the word is used it refers to Anopheles, distinguished primarily from the ordinary gnat by the great length of the maxillary palpi, though this is not the only difference. It is spoken of in this country as the spotted gnat.

Distinct Features of Anopheles and Culex.

In the resting position the *Anopheles* stands with the two pairs of front legs on the wall or whatever it is resting on, and the hind legs and the body raised at a distinct angle from the surface, whereas *Culex* has the hinder part of the body disposed *towards* the surface, giving the gnat a hump-backed appearance.

The wings of *Anopheles* are spotted or dappled; those of *Culex* are not.

The larva of *Anopheles* does not frequent sewage or foul water; that of *Culex* does.

The larva of Anopheles has no respiratory syphon, that of Culex has.

Anopheles rarely bites by day, and is not attracted by light in a room.

The palpi of Anopheles are as long as the proboscis, those of Culex are short, perhaps about one-quarter the length, and this is the character by which they can be most easily recognised.

In this country—speaking now from my own observations—the impregnated females of the Culicidæ pass the winter in a state of partial hibernation (*i.e.*, they are never so far insensible to their surroundings as not to take to a feeble flight when they are disturbed) in quiet, cool places, where they are not likely to be disturbed, and they appear instinctively to choose such places about the rafters of sheds and outhouses, or rough stables or cellars or disused rooms, generally near where tubs are kept for catching rain-water.

Modern mosquitoes have been classified by Theobald by the character of the body and wing-scales.

They are also distinguished by the venation of the wing.

In all mosquitoes the two posterior forked cells towards the apex of the wing are divided by a single longitudinal vein, and the veins are covered with scales.

These two characters will readily distinguish mosquitoes from all other flies.

Amongst modern mosquitoes known to be carriers of disease might be mentioned specially—

(1) *Anopheles maculipennis*—a carrier of malaria.

(2) *Stegomyia fasciata* or *Ædes calopus*—the only carrier of yellow fever.

(3) *Culex fatigans*—the chief carrier of elephantiasis.

A Few Notes from my Notebook.

Dec. 26th, 1890.—After a fortnight of severe frost, during which I had kept exposed in a cold room a gnat, a Cyneps, and a bumble bee, they are all alive, notwithstanding the severity of the weather, which proves that other insects besides Lepidoptera may pass the winter in a state of hibernation in the adult stage.

1891, April 11th.—I have kept some of the larvæ of *Chironomus plumosus* all through the winter (a severe one) in water in small glass vessels.

They make for themselves cocoons of their own excrement and any other particles of matter at the bottom of the water, and in these they have remained all the winter.

During the severe frosts the water in which these larvæ were kept was frozen into a solid block of ice; while the larvæ were thus embedded in the ice I noticed a small air-bubble at the caudal extremity of each larva.

Notwithstanding this they were all alive and well after the frost.

The first larva took on the pupa-stage on the 7th, and my first mature imago, a male, has emerged from the pupa to-day, the 11th, having thus survived all his exposures and hardships.

Gnats.

1892, Jan. 31st.—There are some dozens of small black gnats, since identified as probably Chironomidæ, on the window of my study, two of them infested with acarian parasites (*Sejus*). Where had the larvæ of these flies been living—not in water—or had they been hibernating?

I have since noticed, after reading up the subject, that these gnats may be seen on any warm day in winter on the wing.

1893, June 14th.—I have reared these gnats from larvæ and pupæ

found under the bark of dead elm trees—the flies, or imagos, came out to-day. One may suppose, therefore, that the ***habitat*** of their larvæ is rotten wood or bark or the damp cambian layer between the wood and the bark of dead trees.

1914, March 1st.—Captured hibernating female mosquito in surgery lobby.

1917, Dec. 10th.—Disturbed a hibernating female Culex in my greenhouse.

Geological Distribution.

Besides being the carriers of these minute organisms from host to host, have mosquitoes any other rôle in the great scheme of Life?

For an answer let us turn to that charming book, "The World of Life," by the late highly esteemed Dr. Alfred Russell Wallace, which I never tire of reading.

In the preface he tells us that in all the marvellous structures of living things there is absolute necessity for an Organising and Directive Life-principle in order to account for them. He says:—

"I argue that they necessarily imply: First, a Creative Power, which so constituted matter as to make these marvels possible.

"Next, a Directive Mind, which is demanded at every step of what we term growth.

"And, lastly, an ultimate Purpose in the very existence of the whole Life-world in all its long course of evolution throughout the æons of geological time."

What, then, is the Purpose of mosquitoes? Quoting from Mr. Seebohm's books on the migration of birds to the Arctic regions, he tells us they are attracted there for breeding in the short Arctic summer, many of them (and he identified 165 species, comprising many millions of individuals) by the swarms of mosquitoes.

"That day (June 2nd) I recorded in my journal, with many groans, the arrival of the mosquitoes. Horrid-looking beasts, with bodies one-third of an inch long, monsters—the *Culex damnabilis* of Rae—with proboscis ***internali veneno munita*** (which I translate 'diabolically fortified with poison'). I foresaw that we should have opportunities enough to study the natural history of these bloodthirsty creatures to our hearts' discontent."

About a month later he writes when searching for eggs, properly identified:—

"Doubtless the proper thing to have done would have been to lie down and watch the birds into their nests; but to become the nucleus of a vast nebula of mosquitoes is so tormenting to the nerves that we soon came to the conclusion that the birds had not begun to breed, and

that it was no use martyrising ourselves to find their eggs. The mosquitoes were simply a plague. Our hats were covered with them ; they swarmed upon our veils ; they lined with a fringe the branches of the dwarf birches and willows ; they covered the tundra with a mist."

But this was quite at the beginning of the season, and he adds :—

" We were told that this pest of mosquitoes was nothing as yet to what it would become later. ' Wait a while,' said one Job's comforter, ' and you will not be able to see each other at twenty paces distance ; you will not be able to aim with your gun, for the moment you raise your barrel half-a-dozen regiments of mosquitoes will rise between you and the sight.' "

And Mr. Seebohm described how he was protected by india-rubber boots and cavalry gauntlets, and a carefully constructed cage over his head, without which he never dared go out on the tundra.

I have but touched the fringe of a big and important subject.

It is true of the British Coleoptera and Lepidoptera that a man must work very hard before he can hope to add a new British species to either order ; but any entomologist who cares to take up a study of the Diptera may find himself able to add considerably to our store of knowledge.

Even amongst our commonest insects the habits and structure of any one species would furnish any person with a taste for such pursuits with sufficient employment for a lifetime. The collector's province may be exhausted in a few years, but the observer's—*never*.

When an observer fixes his attention reverently on any living thing, and discovers peculiarly specialised parts or organs, he asks himself, " What is this ? How has it come to be as it is ? What is its purpose ? " And so, in this spirit, we must recognise and acknowledge, behind these wonderful mouth-parts of blood-sucking flies, a Creative Power, a Directive Mind, and an Ultimate Purpose ; and, though we have not yet arrived at the exact truth, it appears to me quite certain that those coming after us will discover that the purpose of these has been through long ages of time, and is still, the transference of these minute organisms from host to host, in nature and in natural environments, in such small and repeated doses as either to render the hosts tolerant, or to kill off the weakly in the struggle for existence.

It is the interference of Nature's insurgent son—Man—that has brought about so much confusion, and has imposed on him the task of bringing order out of the chaos he has created One of these tasks is to check the ravages of these blood-parasites which he has been the means of transporting from their own environments all over the world, and to do this a knowledge of their intermediary bearers—blood-sucking flies, ticks, etc —is incumbent.

A couple of short quotations from Lowell seem to me to be specially applicable to the progress of Science :—

New occasions teach new duties ; Time makes ancient good uncouth ;
They must upward still and onward who would keep abreast of Truth.
New times demand new measures and new men ;
The world advances, and in time outgrows
The laws that in our fathers' times were best :
And, doubtless, after us, some purer scheme
Will be shaped out by wiser men than we,
Made wiser by the steady growth of truth.

TRANSMISSION BY COWS' MILK OF B. DIPHTHERIÆ.

By G. GAIR, M.R.C.V.S.,
Conon Bridge.

EARLY in July this year a serious outbreak of diphtheria occurred in a certain district of this county. The Medical Officer of Health for the county instructed me to make a thorough investigation with the object of ascertaining the source of the outbreak ; the investigation was to include the bacteriological examination of the milk and water supply of the various dairies supplying the affected area. The examinations were duly made, and reports forwarded to the Medical Officer, a duplicate of which was sent by him to the Local Government Board. Considering how little is known of the morphology or habit of this small organism outside the human body, it must be evident how difficult it is to isolate it outside the human throat and so discover the source of infection. It is well known that an important part is played by dry infected material, dust, etc., in bacterial contamination of milk and other food-stuffs. The most important source of infection is by human carriers. In these people the crypts of the nostrils protect the bacilli from the action of ordinary antiseptic dressings. They may be also found in the nose, in otitis media, pharynx, wounds of animals, and various chronic suppurating conditions, *i.e.*, poll evil, fistulous withers in horses, etc. With exception of fatal cases in the lungs of people, the organism is entirely local, and does not enter the circulation or viscera. It is frequently associated with staphylococci, streptococci, pneumococci and cocci of the micrococcus catarrhalis type, etc. (symbiosis). For the purpose of ascertaining whether the milk supply was implicated I made a careful examination of the udders and teats of the cows, but no sign of abrasion or old scars was found on them. Samples of milk were taken from each of the dairies, plated on blood serum and blood agar, incubated for eighteen hours at 37° C., with the result that characteristic colonies were observed on the tubes plated with milk of a certain dairy ; colonies appeared almost the size of pin-heads, convex surface, whitish yellow in colour, circular, moist, and opaque in appearance, remained discrete, did not tend to run together. Although Loeffler's coagulated blood serum is the best medium to use for diagnostic purposes, I found the growths on the

blood agar tubes very luxuriant. It could not be said that the colonies on blood serum showed any special features, as some cocci show colonies which would be difficult to distinguish, microscopically, from those of the Klebs-Loeffler's bacillus. Even some strains of the diphtheria bacilli may show yellow colonies instead of cream-coloured growths. On ordinary agar, as a rule, growths are slow and colonies small, even after twenty-four hours' incubation. The growth, however, was much richer on glycerine agar—5 to 7 per cent., and show all the characteristic granular appearance and irregularborders. On glycerine agar tubes, smeared with human blood, the red colour is changed by the diphtheria bacilli, while Hofmann's bacilli do not alter the red colour; in fact, the members of the diphtheroid group do not possess this hæmolytic power.

The growths on blood agar were not unlike those obtained in the case of staphylococcus pyogenes, viz., a yellowish laked zone and round colonies. On being tested the growths were markedly acid producers.

A bouillon with a + 1 reaction becomes a + 2·5 to + 3 in about 35 hours. In peptone water indol reaction was given with or without addition of nitrite.

This reaction is said to be due to the presence of skatolecarboxylic acid. Glucose broth becomes strongly acid in 24 hours. No acid produced in lactose broth. The pseudo-diphtheroid group, Hofmann's and xerosis, produce alkaline reaction in these media, while B. septus is slightly acid.

Swabs from the throats of the dairy workers were obtained and similarly incubated as above, but in no case did I find bacillus of diphtheria. It is surprising what a large number of even healthy people harbour the Hofmann's bacillus; probably 10 per cent., while 1 or 2 per cent. harbour the granular types; of these 1 in 5 may be virulent to the guinea-pig. Direct examinations from swabs may be possible in about 30 to 35 per cent. of cases without incubating, but in these examinations the heat fixed film should be covered with a 20 per cent. solution of acetic acid for a few minutes, which greatly helps to clear up the details of the bacilli in smear Wash off acid and dry with fluffless filter paper and dry in air. All smears are better dried in air before fixing in heat. The bacilli stain more uniformly with such stains as Neisser, Toluidin blue or Gram, and are not so apt to be clubbed. The routine method adopted where there is any doubt is to stain—

(1) With Löffler's alkaline methylene-blue, 2 minutes.
(2) Gram stain, but not to decolourise too far.
(3) Neisser's stain.
(4) Neisser's *modified* stain, which gives even better results than Neisser stain.

With Löffler's the picture is very characteristic of B. diphtheriæ, the polar bodies showing intense blue spots.

With Gram stain great information is obtained, as this stain helps to clear up any confusion which may exist in regard to the masses of cocci lying about, which may be mistaken for barred or segmented diphtheria bacilli. It also shows us that the diphtheria bacillus and the pseudo-diphtheria bacillus are the two small Gram positive bacilli found in the mouth. With Neisser we have the characteristic bright blue dots at either end of light brown yellowish rods. Neisser modified, however, gives a better background.

The Klebs Löffler's bacillus of diphtheria in microscopical preparations of diphtheric membranes or cultures on artificial media is a non-motile, rather slender curved rod of variable length—the relation of breadth to length not exceeding 1 to 4, although it may be less. It is Gram positive, but loses its colour by acid alcohol in the Gram-Gunther staining method. It does not form spores. It shows irregularities in staining, such as beading or banding, and, in particular, deeply stained dots at either end (meta-chromatic granules). These granules show well in an 18 hours' culture, very abundant in 36 hours culture, and are best seen with Neisser's stain. In older cultures clubbing and involution forms are well seen. Parallelism is a characteristic feature, four or five bacilli lying side by side like palisades. They may also show V shapes, or false branching. The remarkable multiplicity of forms in old cultures, such as round rods and long attenuated bodies swollen in centre, and excessively club-shaped rods, is certainly typical of true diphtheria. It is not killed by drying. Retains its virulence for months in dust. It is aerobic and facultative anaerobic, its thermal death-point being 58° C.

Diphtheroid Bacilli.—These are bacilli resembling in some respects the true diphtheria bacilli, and are not infrequently met with in pathological as well as normal conditions. They may be found in wounds of domestic animals, and in various organs of the human subject. Hofmann's bacillus may frequently be isolated in various anginal conditions in the human subject. Almost pure cultures are found occasionally in scarlet fever throats; they are frequently associated with streptococci or staphylococci. They are short rods tapering at both ends, 1.5 μ to 2 μ long, often occurring in pairs, non-motile, Gram positive, no metachromatic granules; polar staining and segmentation do not occur. The parallel grouping is similar to the true diphtheria bacillus. Involution forms not met with.

In culture with this organism the cream-coloured colonies obtained on agar and gelatine can hardly be distinguished from those of true diphtheria, but appear somewhat larger. On alkaline potato the

cream-coloured colonies produced are visible on third day of incubation.

Another organism strikingly resembling B. diphtheriæ is the B. septus, found in post-nasal pharyngitis of colds. It is Gram positive, but does not show granules with Neisser's stain. Segmentation may be observed with other stains ; it appears as short ovoid rods, staining at polar ends, no club forms, forming profuse white opaque growth on agar raised and ringed centre. The white colonies on blood agar tend to coalesce. The reaction is slightly acid to glucose, lactose, saccharose, and maltose broth. The organism is frequently associated with catarrhal conditions of nose, throat, and pharynx.

B. Xerosis.—Is another organism of the diphtheroid group, closely resembling in morphology and in staining reactions the B. diphtheriæ. It is found in follicular conjunctivitis, and said also to be found in many normal conjunctivæ. Growth is slower on blood serum, minute and almost colourless even in thirty or forty hours' incubation. Difficult to grow on agar, rarely on gelatine, no granules with Neisser's stain, rods short, club forms, involution forms frequent. In old cultures banded forms of bacilli are not infrequently seen. Alkali produced in glucose, lactose, sacchrose, and maltose broths.

The various waters on farm, to which the cows had access, were examined bacteriologically, but with negative results. In endeavouring to arrive at a correct diagnosis of the presence of B. diphtheriæ, and to distinguish it from the pseudo-diphtheria group, it would be well to observe the following points :—

1. Appearance of growths on Löffler's blood serum.
2. Results of stains with Löffler's methylene blue, Gram, and Neisser.
3. Non-motility in hanging drops.
4. The parallel grouping characteristic of true diphtheria.
5. Absence of spores.
6. Presence of clubbing or involution forms ; none with Hofmann's.
7. Reaction of young cultures, showing granules with Neisser.
8. Bacilli longer than Hofmann's.
9. Forms acids with glucose, Hofmann's does not ; segmentation marked, not so marked with Hofmann's.

Just before and during the outbreak of diphtheria the weather was sultry and dry, and one of the three byres, the east one, was invaded with myriads of flies, which settled on the bodies, udders and teats of cows, greatly annoying them. The walls of the byre were simply black with this pest. The reason why this particular byre was so infested was that the middle and west byres, which ran parallel to one another, had covered sheds and sliding doors at their entrances, but no such structural arrangement existed at the east byre, which

facilitated the entrance of the flies. Unfortunately, shortly before outbreak, the sewage tank overflowed in the vicinity of these byres, and in the semi-solid pool of sewage enormous numbers of flies deposited their eggs. The flies came directly fro mthe pool, settled on the bodies, leaving excreta on udder, teats, etc., which at next milking was taken down into pail with hands of milkers.

The cows of this byre and middle one were always milked first, and the milk despatched to the district in which the diphtheria occurred. The cows in west byre, into which no flies obtained an entrance, were the last to be milked, and this milk only was used by officials on the farm. No case of diphtheria occurred amongst those using this milk; every case of infection was entirely among the customers who obtained the milk from the east and middle byres of this dairy.

After the isolation of the organism from the milk of these two byres, I had all the milk at each milking put in tins, placed in a large iron vat covered with iron lid and felt, into which steam was injected from below, raising the temperature to 185° F. for a minute. The milk was then cooled down and despatched to the various customers. The sewage tank was filled with earth, which at once stopped the fly plague. After these measures were taken not a single further case of diphtheria occurred in the district, and up till now, four months after, no fresh cases were reported. I was unable to test the virulency of the growths on guinea-pig, no facilities being available for such biological test.

An epidemic of diphtheria or typhoid, when due to the milk supply, will exhibit the following features, as this outbreak has done :—

(1) Outbreak sudden.
(2) Many attacks occur together.
(3) The larger proportions of householders will have a common milk supply
(4) Incidence of disease falling on the principal consumers.

Clinical Cases.

By A. PAYNE, F.R.C.V.S.,
Weybridge.

A REMARKABLE FRACTURE.

Upon the evening of Sept. 13 I received an urgent call to a horse six miles out, the only particulars given being that the animal was in great pain in one of his hind legs.

I found my patient in the stable yard of an inn (a bay cob about

10 years old), showing symptoms of distress, and resting the near hind leg with the toe just touching the ground.

Upon manipulation a crepitus was plainly discernible, and a rectal examination demonstrated a badly fractured pelvis.

The pony was a fairly well-known trotter and, the owner being away, his man was exercising him in a light governess car. He informed me the pony was going at the rate of 10 or 12 miles an hour, when he went suddenly dead lame. It seems incredible, but the poor animal was "walked about 200 yards to the stable yard."

I asked the knackerman to send me the fractured bones, and when they arrived I found the left innominate bone in five pieces and the right completely fractured at the shank of the ilium.

JAUNDICE IN THE DOG.

AIREDALE puppy, nine months old, in fair condition.

Had been listless, with no appetite, and occasional vomiting for the last three days. I saw the case first on Oct. 2nd, about 7 p.m. After examination, etc., informed my client that in my opinion the dog had eaten decaying animal or vegetable matter, and was suffering from a slight toxæmia and gastric catarrh.

Prescribed—

Bismuth Carb.	
Sod. Sulphi. Carbol. a a	ʒ ij
Aquae	ʒ vi
	M ji

ʒ ij t. d. 3.

Diet.—Administer milk and lime-water, and white of egg and lime-water, alternately every two hours.

Two days later I heard from my client that the dog was about the same, but she had noticed that the gums and mouth were very yellow; this no doubt had escaped me, as I saw the dog by artificial light.

I called the following day and found the tissues stained yellow, and the dog showing the characteristic facial expression I have always associated with jaundice. No symptoms of distemper were present, and as far as the owner knew the dog had never suffered from that disease.

I did not change the treatment, but directed that moist heat should be applied round the region of liver and stomach every four hours for ten minutes. Three days later the patient was decidedly better. Sickness ceased, and liquid food was taken voluntarily.

He eventually made a good recovery.

Fox-terrier dog, 5 years old, in poor condition.

The dog had been ill for a week, with intermittent sickness, intense thirst, attended by the frequent passing of small quantities of a semi-fluid light brown fœces. For four days the dog had taken no food, with the exception of small quantities of milk, which was returned.

Symptoms.—It is unnecessary to go into details, but the skin and mucous membranes were stained a deep yellow; also the hair inside the thighs and abdomen with bile in the urine.

The temporal muscles were wasted, and the facial expression was haggard to a degree.

The same treatment was applied here as in the former case, with addition of Morphia gr. $\frac{1}{8}$ and Acid. Hydrocyan. Dil. m ij. On the third day there was a slight improvement, which was maintained till recovery took place a week later.

I must own that I have since fancied that Sod. Sulpho. Carbol. exerted some influence in cutting short the career of the disease in both these cases, as hitherto I have lost the majority of my cases of jaundice.

Of course, I quite realise that the cause of the jaundice in both cases was shrouded in mystery, as neither apparently was of the enzootic form, and as the dogs both recovered it was not due to structural hepatic disease.

We therefore conclude that the cause was some influence preventing the onward flow of bile, which consequently was absorbed by the blood.

The most feasible and likely cause would be either some obstruction existing in the neighbourhood of exit of bile duct in the duodenum, or bacterial or allied material propagating in the bile itself.

This invasion, in my opinion, is more likely to occur from the intestinal canal. We know that dogs will eat filth at times, and it is more than probable that frequently certain pathological organisms exist in this material, which, if the animal's defence is weakened from any cause, will have its effect.

Sulpho. Carbolates are recognised as intestinal disinfectants, and are used extensively in the States in intestinal diseases of swine.

WHAT WAS THE MALIGN INFLUENCE?

DURING the last three weeks at a farm in my district fourteen heifers have calved. Of these, six gave birth to full time dead calves, including three cases of Dystokia. A shorthorn and Dexter gave birth at normal period of gestation each to a "mummified" fœtus which apparently died in utero at about five months. Both these heifers were bulled by the same Dexter. I have made enquiries, etc., but cannot find any cause for these casualties.

INTERESTING CASE OF SAND COLIC.

In the *Veterinary Journal* of Dec., 1916, was a translation of an interesting and instructive article on Sand Colic (F. Friez).

The author states that he has investigated 58 cases in three months, that the largest quantity of sand found was 26½ lbs., and that there was never any sand in the cæcum.

In 1915, I had under my care a number of Army horses stationed near my house on a private estate where it was impossible for them to get any sand.

Three animals were attacked with colic at different times within a period of three weeks. The symptoms presented were identical with those described in the translation, and all cases passed sand during the attack which was of a dark grey colour.

One eventually died, and a *post-mortem* examination was made in company with a colleague, which revealed the following :—

A misplacement of the pelvic flexure. The first and second portions of the big colon were packed with sand extending just round the pelvic flexure where the misplacement occurred.

The cæcum also was *packed* with sand and ingesta.

There was general septic enteritis of the big intestine, the mucous membrane being considerably thickened. The sand was dark grey and gave off a strong septic odour. The sand collected weighed about 90 lbs.

The body was fairly well nourished, and the stomach contained a quantity of food. The horse had been at duty the time he had been in the unit, prior to which I could obtain no history. Water was supplied from the main, and the surface soil was not sandy.

Abstracts.

THE SCABIES PROBLEM ON ACTIVE SERVICE.*

By Major H. MacCORMAC, M.D., F.R.C.P.
(Royal Army Medical Corps)
AND
Captain W. D. D. SMALL, M.D., F.R.C.P.E.
(Royal Army Medical Corps).

Every man incapacitated from duty—it matters not by what means—is a gain to the enemy. From the point of view of the Army and of military efficiency those diseases ought to rank highest in importance which cause most "casualties." Judged from this aspect,

* Journal of the Royal Army Medical Corps.

diseases of the skin occupy one of the premier positions, for under the conditions of trench warfare it is inevitable that they are met with in large numbers. The exact extent of the wastage for which they are responsible is known only to the authorities, but it is apparent to all that, since many are contagious, successful efforts directed towards prevention and cure will amply repay by a very large gain of fighting men.

Of the skin diseases found amongst soldiers—excluding pediculosis—scabies is by far the commonest. When uncomplicated, its effects incapacitate a man but little ; but in consequence of the hard conditions of active service secondary pyodermic complications are frequent and severe, and these are a very real cause of prolonged sickness. In contrast to the three or four days required for the complete cure of a simple case, we have found that when pyodermic complications are established the period necessary is greatly prolonged, the average stay in hospital over a large number of cases being 31·67 days. It should be explained that this figure does not include either treatment elsewhere—which sometimes amounted to many weeks—or the days spent in journeying to the base.

Scabies as seen amongst soldiers, differs in type from that usually met with in civil practice, and unless the differences are appreciated many cases will not be recognised, leading to dissemination by undetected "carriers." The eruption is distributed much in the usual fashion, the sites of election being the wrists, hands, penis, lower abdomen, anterior axillary borders, elbows, and buttocks. The characteristic interdigital burrows, however, are but rarely seen ; they were present typically in only thirteen* of our cases. Vesicles are much more common, though in quite a number of cases the hands are entirely free from lesions of any sort. A correct diagnosis can only be made after inspection of the whole body. In the majority of cases the penis is involved, and the discovery of papules or crusts on either skin or mucous membrance is almost pathognomonic. This serves in doubtful cases to distinguish scabies from the acute pediculosis so frequently seen, and is for this reason an extremely useful diagnostic symptom.

Besides the primary lesions of scabies, others due to secondary coccal infection are common and important. They may be so severe as to mask the primary disease and render it liable to be overlooked. Most common is a variety of impetigo distributed in a characteristic manner on the lower buttocks, elbows, and knees. The presence of pustules

*This figure does not include cases where one or two indefinite lesions could be found after prolonged search : including these the percentage would be about 45. It is our impression that lately burrows have been observed with more frequency than some months ago.

or crusting on one or all of these regions should at once suggest scabies and lead to search for the more primary lesions elsewhere. Occasionally the impetigo becomes very widely spread, but even in such cases a correct diagnosis can be made by observing the characteristic grouping on the regions indicated. In numerous cases the impetigo lesion extends more deeply into the dermis and takes the form of an ecthyma. Occasionally a linear variety of impetigo is present.

Boils and other follicular infections of the skin are frequent, and tend to recur indefinitely so long as the primary scabies remains uncured. No case should be considered as one of simple furunculosis until itch has been carefully sought for and excluded—or, if found, until the patient has had a thorough course of sulphur treatment.

Some degree of adenitis is the rule in all cases of scabies which have developed any form of coccal infection. The glands of the groin are those most frequently involved, and suppuration in this situation forms a not uncommon and often troublesome complication. In the upper limb severe lymphangitis with foci of suppuration seems to constitute the corresponding lesion. These septic foci usually occur in the upper third of the limb, and on its inner aspect.

Dermatitis as a complication of scabies is most frequently the result of unsuitable, misapplied, or too long continued treatment. In these instances the abdomen, thighs and arms are the commonest sites—and all degrees from simple erythema to moist weeping or exfoliating eczema may be observed.

Subjects of the seborrhœic diathesis seem particularly liable to this complication.

Localised dermatitis may originate in a group of vesicles or other scabetic lesions, which, together with the intervening skin, have become irritated by scratching; considerable local thickening of the skin becomes superadded and the result is an area of chronic infiltrative dermatitis—in part scabetic and partly artefact. This is most commonly seen in the flexure behind the knee or on the outer aspect of the thigh.

In its diagnosis, scabies must not only be distinguished from the pyodermic conditions apt to be associated with it, but also from pediculosis, pompholyx, syphilis, and an unusual papular urticaria.

From pediculosis, the diagnosis is chiefly made by the difference in distribution, and the absence of infection of hands, wrists and penis. Not only may the two conditions be associated, but the papule* common to both, can only be distinguished with extreme difficulty.

The vesicular lesions of pompholyx are much more deeply seated,

* Pediculosis as usually seen in France occurs in an acute form and characteristically presents a papular type of eruption.

more numerous, and more difficult to rupture than those of scabies, and are chiefly limited to the hands and feet.

A single large scabetic lesion on the penis may give rise to question as to whether or not the patient is suffering from venereal disease, and the eruption on the body may be mistaken for a secondary rash ; the diagnosis is not always so easy as might be supposed, particularly if risks of venereal infection have recently been incurred. Here also the two conditions may occur together.

A type of papular urticaria which we have not observed in civilian practice may simulate scabies very closely. In this condition, small red papules occur over the body generally but particularly on the abdomen and anterior axillary folds ; wheals, or some degree of dermographia, may often be found or induced. Again, the wrists, hands, or penis are not involved, and the disease tends to disappear suddenly, while relapse is frequent.

The methods of combating scabies fall under the two headings—prevention and cure.

(*a*) *Preventive Measures.*—Scabies it is generally accepted is rarely contracted excepting after prolonged and intimate contact with infected material, the acarus does not wander afield like the louse. This being so it is difficult at first sight to explain how the soldier gets the disease. His opportunities for removing clothing and coming into contact with an infected medium are few and are only fully possible when in rest. All the evidence—particularly the occurrence of epidemics amongst officers sleeping in the same dugout, or amongst groups of men quartered together—points to blankets as the chief means of disseminating infection. Prevention then should include frequent disinfection of blankets by such a method as the Clayton sulphur vapour apparatus, or some other accepted form of sterilisation. A few cases seem to be contracted from horses, and the protection of the soldier therefore includes efficient treatment of the horse. Great stress is laid by French writers * upon the venereal origin of scabies, and this possible source of infection requires to be kept in mind.

Of the greatest importance is the early detection of every case of scabies. Each case undetected acts as a "carrier," and is the potential starting point of an epidemic. Frequent and thorough inspection of the individual soldier is the only means whereby early diagnosis can be assured. Infected men should be segregated and treated as speedily as possible, for—in addition to preventing dissemination—early diagnosis enables treatment to be instituted while the disease is still uncomplicated, and rendersd its course short—correspondingly conserving man-power.

(*b*) *Curative measures* should include exposure of the parasite and its ova and their destruction by remedies short of producing dermatitis.

The subsequent disinfection of clothing and bedding to prevent reinfection must never be omitted.

Sulphur, it is generally acknowledged, is the most efficient remedy for the treatment of scabies—and certainly by reason of its procurability and cheapness it is that most suited for the extensive requirements of an army. It is a remedy, however, which requires careful and intelligent application, and care must be taken that the patient receives neither too little nor too much treatment—the former leaving him uncured, the latter producing dermatitis, and so increasing his period of unfitness. How this remedy should be employed is already so well known that a repetition of the details would seem unnecessary had it not been for the recent reintroduction of the sulphur vapour method. This form of treatment, so scathingly condemned by Hebra† in the first half of the last century, seems to have again obtained vogue, in spite of the fact that it was so completely discredited nearly a hundred years ago. Indeed, it has so long been regarded as one of the barbarities of the Dark Ages that it is rarely mentioned in modern text-books. We have had opportunity of noting a number of cases treated by this method. Some have suffered from severe dermatitis, numerous others have been uncured. The history given by some of these latter is instructive. After the vapour treatment, the itching was relieved, and improvement appeared to take place in the eruption. The patient seemed cured, but after a period of about two weeks the disease again became active, so that it would appear that in these a false sense of security had been obtained and a "carrier" discharged to further disseminate the infection. That a certain number of cases may be cured by this method is probably correct, but its uncertainty and the special danger of dermatitis, from which it is inseparable, give us no option but to emphatically condemn its use.

Liquid preparations of sulphur, such as Vlemingx's solution (liquor calcis sulphurata) are undoubtedly efficient agents for the cure of scabies, but they are also particularly liable to cause dermatitis, and considerable experience is necessary for their satisfactory employment.

For its simplicity and certainty, no method is so suited for general use as that of simple inunction with sulphur ointment (B.P.), and admirable results will invariably be obtained, if the treatment is conscientiously carried out with due regard to the necessary detail It must, however, be insisted that the method of application is of parmount importance. This may be briefly outlined as follows :—

(1) On the first day of treatment, the patient is given a hot bath, and provided with plenty of soft soap, and a large, moderately stiff nail-brush.

(*a*) Before entering the bath, he rubs himself thoroughly all over with

the soap, massaging it into the skin, and paying particular attention to the fingers, toes, wrists, penis and axillæ. This should be continued for at least ten minutes.

(*b*) He then enters the bath, which should be both long enough and contain a sufficiency of water to permit of immersion to the neck. After first steeping for fifteen minutes, he scrubs himself vigorously all over with the nail-brush for the purpose of opening burrows and vesicles. In cases where the eruption is particularly severe or painful, this part of the procedure may be correspondingly modified. After the bath, a final inspection should be made, when any unruptured vesicles can be opened with a surgical needle.

The bath is given with the sole object of opening up the haunts of the acarus and exposing it to the action of the parasiticide to follow. It is obvious that shower or steam baths cannot fulfil this purpose, and examination of a patient so treated will reveal the burrows and vesicles still intact.

(2) After removing the soap and drying, a liberal quantity of sulphur ointment (B.P.) is provided, with which the patient rubs himself vigorously all over, from the neck downwards, special attention being paid to the affected parts and to the fingers, wrists, genitals, axillæ, toes and ankles. The ointment must be liberally applied and thoroughly rubbed in, so that when finished he should be literally "soaking" in it.

The inunction is to be repeated in this manner twice daily for three days—*i.e.* until the patient has had in all six applications. Each must be complete, and for this it is obvious that all clothing be first removed. The treatment of limited parts of the body is useless.

(3) Finally, on the fourth day, but not before, a second bath is given and all the patient's clothing and bedding sterilised to prevent reinfection. Even such articles as wrist straps, strings of identity disks, gloves, etc., should be included.

The vast majority of cases, unless there be secondary complications, will be found cured after three such days of treatment. Should any doubt exist, 2 per cent. beta-naphthol in vaseline may be used daily for four more days. Only under exceptional circumstances should sulphur ointment be applied for more than three days, since its continued use is liable to cause severe dermatitis. Indeed, insusceptible persons, a mild degree may be occasioned by the three-day treatment. This is usually easily cured by zinc ointment or Lassar's paste. At the completion of treatment, the existence of some degree of itching is not uncommon; this is due to the remedy and does not indicate failure of cure; it will rapidly pass off, and should be disregarded. Some days also will probably elapse before all the lesions of scabies have disap-

peared, although the man is no longer infective. A certain degree of pigmentation may persist indefinitely.

CONCLUSIONS.

(1) Scabies in soldiers differs in type from the ordinary form of civil practice, particularly in the frequent absence of burrows or other lesions upon the hands, and in the great liability to pyodermic complications.

(2) The primary disease is often masked by complications. In every case of impetigo, boils, dermatitis or inguinal adenitis, scabies must be carefully excluded before the diagnosis is considered complete.

(3) Cases of scabies complicated by any of the above necessitate about ten times as long a period in hospital as do simple cases. Therefore early diagnosis and treatment, before secondary diseases have become established, are of the greatest importance.

(4) Regular medical inspection is essential for the detection of "carriers." Infected men should be segregated and treated at the earliest opportunity. Horses may also require inspection. Blankets, being the chief source of spread, should be sterilised as often as possible.

(5) Treatment by means of sulphur vapour is a method harmful often to the patient, and at all times dangerous to the community in that it manufactures a class of scabies "carrier." In the interests of the Army it should be discontinued.

(6) The method of treatment most suitable to service conditions on account of efficiency, simplicity, and cheapness, is inunction with sulphur ointment, but this must be carried out in a methodical and thorough manner, and with careful attention to the necessary details.

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[*] MILIAN. *Paris Medical*, May 6, 1916, page 426.
[†] HEBRA on "Diseases of the Skin" (New Sydenham Society), ii, p. 241.

† Pediculosis as usually seen in France occurs in an acute form and characteristically presents a papular type of eruption.

THE COMPOSITION AND VALUE OF SOME OF OUR COMMON VEGETABLES.*

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THE vegetables commonly used at our tables may be divided into the following general classes:—Tubers, roots, bulbs, green vegetables, vegetable flowers, fruits, legumes, and cereals.

Tubers and roots play an important part as table vegetables—e.g., potatoes, Jerusalem artichokes.

Of tubers, potatoes take first place for home consumption. They

* Department of Agriculture, South Africa.

owe their food value to the carbohydrates (starch) they contain. Jerusalem artichokes also form a valuable addition to the diet.

Of roots, the sweet potato (largely used here) is rich in starch and sugar, on which its food value depends. It has a slightly higher feeding value than ordinary potatoes. Carrots, parsnips, radishes, salsify, scorzonera, turnips, and beets are also largely used.

The most common of the bulb-bearing plants are leeks, onions, shallots, and garlic. Of these the onion is most largely used as a table vegetable.

Amongst green vegetables, of which the edible portion is the leaves or leaf stalks, we have cabbage, brussels sprouts, lettuce, spinach, celery, cress, etc They all contain large quantities of water, generally over 90 per cent , so that they have little food value. They tend to get hard and woody on approaching maturity, so that, like roots, they are best when used in the young, tender state.

In the cauliflower and globe artichoke the edible portion consists of the inflorescence, or part thereof, much altered by cultivation, etc.

Legumes.—Of these, beans and peas are most commonly used for human consumption.

In the early part of the season green beans in the pod are used, when they are valuable for their succulence. They contain a high percentage of water, and have not a high nutritive value. Later, when shelled, the dry seed when cooked is a valuable and nutritive vegetable, containing a high percentage of nitrogenous matter and starch.

Peas, generally used in the shelled green condition, also form a valuable addition to the diet.

Rice and Mealies are the only cereals used as vegetables in South Africa. They are poor in nitrogenous, flesh-forming materials and also in fat. Although in this respect mealies are richer than rice both are valuable for their starch, and must be combined with foods rich in nitrogen and fat to furnish an economical diet. Mealies are also used, cooked, in the unripe condition, and in this state they are succulent and generally relished.

Tubers.—Jerusalem artichokes (*Helianthus tuberosus*) is a tuber-producing plant belonging to the sunflower family. The edible portion consists of these underground tubers, and their principal food value lies in their carbohydrates. The principal part of the carbohydrates in artichokes consists of inulin, so that, in this respect, they differ from potatoes, where it is principally starch. In composition they contain about 80 per cent. of water. Their carbohydrates, the principal food constituent, amounts to 15–17 per cent. In proteid or flesh-forming material they are lower than potatoes, but other-

wise there is not much difference between them and potatoes, both forming a valuable source of carbohydrates in the diet.

TABLE SHOWING APPROXIMATE COMPOSITION OF DIFFERENT VEGETABLES AS USED AT TABLE.

Analysis of Samples as used.

	Water.	Proteid.	Fat.	Carbo-hydrates.	Fibre	Ash.	Sample.
	%	%	%	%	%	%	
Artichokes	79·50	1·98	·20	16·78	·72	·82	1
Beet	86·75	1·49	·12	8·74	·97	·93	4
Carrots	88·59	1·28	·45	7·39	1·30	·99	6
Parsnips	83·06	1·51	·58	11·85	1·92	1·08	2
Radishes	90·95	1·22	·09	6·31	·65	·78	5
Turnips	90·51	1·24	·18	6·10	1·16	·81	4
Onions	86·98	1·72	·31	9·40	·96	·63	2
Dwarf Bean (green in pod) ..	84·61	2·68	·34	9·14	2·34	·89	2
Lima Bean (green shell) ..	71·82	6·38	·58	18·43	1·59	1·24	2
,, dry)	12·10	23·65	1·28	56·25	3·24	3·48	1
Broad Bean	11·55	24·99	1·56	53·42	5·27	3·21	2
Peas (green)	76·95	4·45	·42	14·86	2·33	·99	3
Peas (dry)	13·32	25·70	1·51	52·22	4·18	3·07	3
Mealies (green)	72·59	3·98	·56	20·67	1·36	·84	2
Cabbage	89·18	1·56	·39	5·37	2·43	1·07	1
Asparagus	94·01	1·59	·21	2·70	·68	·81	2
Lettuce	92·66	1·35	·34	3·49	·82	1·34	1
Potatoes	76·29	2·21	·13	19·94	·34	1·29	4
Sweet Potatoes	70·36	2·04	·87	24·31	1·33	1·9	3
Mealies (as used)	66·90	3·14	1·22	27·64	·37	·73	1
Rice (as used)	70.16	2·41	·20	26·71	·22	·30	1

Potatoes.—The potato (*Solanum tuberosum*) belongs to the botanical family *Solanaceæ*. It is one of the most important of our vegetables. The best potatoes are grown in loose, lightish soils where the roots of the plants penetrate easily, and where the soil is of a yielding nature and allows the tubers to develop properly.

Stiff, clay soils are unsuitable for the best quality potatoes. On suitable soils it is one of the cheapest vegetables to grow, and also one of the easiest ones to keep, so that at present it is one of our most important food crops.

The stage of growth, treatment, soil, etc., affect the composition of the potato tuber. Young, immature potatoes are more watery than fully developed tubers, but the average water contents of the potato is just under 80 per cent.

About 17–20 per cent. of the tuber consists of starch, togetehr with very small quantities of sugar, also a very small amount of nitrogenous substances, generally ranging from 2·2–2·4 per cent., but of this not more than half is in the form of true protein, flesh-building material.

The fat or other extract in potatoes exists in very small quantity, and as it is present in largest proportion in the outer layers very little of it is utilisable for food purposes when potatoes are peeled before cooking.

The most important of the mineral constituents of potatoes are

their potash and phosphoric acid, which together amount to about three-quarters of the total ash. The potash alone amounts to about three-fifths, or 60 per cent. of the total ash, which shows the importance of liberal manuring with this fertiliser for the crop. Soda salts, lime, magnesia, silica, chlorine are also found present.

The potato, then, is valuable principally for its carbohydrates These average in round numbers 18 per cent. The fibre or cellulose, of which the cell walls forming the framework of the tuber are composed, amounts to about 4–5 per cent It is therefore essentially a starchy food, but it also contains small quantities of soluble carbohydrates and sugar. The quantity of sugar is relatively greater in young, immature potatoes than in mature main crop varieties which are left to ripen before using. Being a starchy food they are best used with foods rich in protein, such as meat, fish, etc. Potatoes also contain solanin, an alkaloid characteristic of plants belonging to the potato family. This substance is poisonous.

Normally, in potatoes, especially in mealy varieties of the main crop, solanin is present only in very minute quantities. Small and unripe potatoes contain more. Potatoes which have been exposed to the light and turned green also may contain considerable quantities of this poisonous substance. Also, when potatoes get old and have been allowed to sprout in store, the acrid taste so often developed is due to their higher solanin content, and in such old shrivelled potatoes considerable amounts of solarin are sometimes found. This solanin is found in the parts of the tuber where changes in the composition, due to active growth, are greatest—i.e., in the flesh around the eyes and sprouts.

Dried Potatoes.—Attempts have been made to put potatoes on the market here as stock feed in the form of sliced dry potatoes and as potato flakes. They may be sliced and dried directly by heat in a kiln, or they may first be steamed and then pressed between rollers heated with steam and thus pressed into thin flakes. In either form they are generally first moistened and then mixed with chaffed straw, and in this condition are readily eaten by stock. Dry potatoes and potato flakes are the results of attempts to get the potatoes in a compact form, in which their keeping qualities are greatly improved, as the drying stops the action of bacteria which cause decay of the tubers stored in the natural state. Potatoes treated in this way can be stored without fear of deterioration. It takes about 400 lb. of tubers to yield about 100 lb. of the dried product, so that the dried material has a much higher feeding value than the untreated potatoes, and is equal more or less in composition to cereal foodstuffs with a water content of 8–10 per cent.

Potatoes have also been largely used in Germany for the making of alcohol for industrial purposes. The potatoes used for this purpose are not table varieties, but are the result of systematic experiments to produce potatoes as rich as possible in starch and other fermentable material. The tubers are much coarser than table varieties, but are much richer in starch and sugar.

To get profitable returns to farmers and manufacturers the crop must be grown on a large scale, and must be of varieties containing large quantities of starch and fermentable matter.

Potatoes are also much used in Europe for starch manufactures, as potato starch is very valuable in the textile industries.

At the present time in South Africa potatoes are grown mostly for table use, and only the injured and small are used for stock feed. There still exists on the part of farmers a certain dislike to feeding raw potatoes to stock, due to the fact that when injudiciously fed they are liable to cause colic and diarrhœa. These results are only found when potatoes are used in too large quantities and for a long time. Some soothing food like linseed should be fed with them, and not foodstuffs with an irritating effect such as silage and brewers' grains. They should also be added gradually to the ration, and they should be stopped gradually. Only sound ripe tubers should be used, and not sprouting potatoes. For pigs the potatoes should be cooked or steamed, as raw potatoes are not suited to their requirements. When dried potatoes are used as pig feed they are either scalded or soaked in skim milk or whey. There is little doubt that it would make a considerable difference to the profits from potato growing if a potato-drying industry were started, rather than that farmers should have at certain seasons to force their products on an unprofitable market.

Sweet Potatoes (Ipomœa batata).—This plant belongs to the *Convolvulaceæ*. It is very generally used in South Africa as a vegetable, and thrives best on soils of the same character as the ordinary potato is found on—viz., loose, light soils and light loams that are sufficiently supplied with organic matter and plant food for the use of the growing plants. In such soils the roots develop well and are even in quality and of good shape.

In the sweet potato the edible underground portion is a true root, not a modified stem as in the ordinary potato, although it takes practically the same part in the life history of the plant. The sweet potato is propagated almost exclusively by means of shoots or slips, and sometimes failures are due to planting in a similar manner to that adopted with the ordinary potato. Either hibernated slips from the previous season are planted or shoots obtained from sprouted sweet potatoes planted some ten weeks earlier.

Desirable qualities in sweet potatoes :—

The roots should be chunky rather than excessively long and thin.

Also, firm, fresh-looking samples, smooth-skinned, and of medium size are preferable to very large or very small roots.

If sweet potatoes are put on the market before they are mature they can generally be recognised, as a cut surface turns greenish black round the edge, also a milky juice sometimes exudes from immature sweet potatoes, which turn black on exposure to the air. Such potatoes are not sufficiently mature.

In their chemical composition and food value there is a considerable similarity between the sweet potato and the ordinary potato.

Sweet potatoes contain more dry matter and less water than ordinary potatoes, with a corresponding increase in their carbohydrate content.

The carbohydrates in the sweet potato differ from those in the ordinary potato in containing considerable quantities of sugar, principally as cane sugar.

South African-grown sweet potatoes average 4·6–6·6 per cent. of sugar, but the amount is found to vary considerably. They also contain 20 per cent. or more of starch, so that compared with ordinary potatoes they are richer in carbohydrates.

Their content of crude fibre is higher, and they also contain more fat or other extract, but their proteid content is lower than in the ordinary potato.

There is thus very little difference in nutritive constituents between the sweet and the ordinary potato, although as a heat, fat, and energy producing food it is more valuable.

The sweet potato is also a cheap vegetable to grow, and merits a more extensive use as a table vegetable than is at present made of it. It might also where sufficiently cheap be fed with advantage to milk cows, as this practice where followed is said to keep the animals in a healthy condition.

Pigs are also very fond of the roots, and can harvest them themselves, though, as with ordinary potatoes, they require to be fed with some flesh-building or protein rich food, such as peas, beans, etc. for the best results. If all the potatoes are not required for food or stock feed the residue might also prove of value for the production of alcohol for industrial purposes.

Sweet potatoes are even more suitable for this purpose than ordinary potatoes, as they contain a higher percentage of fermentable matter, so that, weight for weight, sweet potatoes yield more alcohol than ordinary potatoes.

A yield of sixty bags per acre would produce about 2,700 lb.

of fermentable matter per acre, which would yield about 160 gallons of 93 per cent. alcohol.

Succulent Roots.—Beets (*Beta vulgaris*), garden beets of the red variety, are used to a considerable extent in this country as a table vegetable, though beets of the yellow variety are also sometimes seen on the market.

So far sugar beets when grown in South Africa have been grown principally as a fodder crop, and in the pulped condition form a very useful addition to the ration of dairy cows.

Garden beets on the average contain 87–90 per cent. of water. Their ash and protein content is similar to that of potatoes. The fat is generally lower, often negligible, and they contain 7–9 per cent. of carbohydrate, mostly as cane sugar, wherein lies their value as a food product.

Carrots (*Daucus carota*).—There is a large number of varieties of carrots, but those most commonly raised here for table purposes are of medium size and deep yellow colour.

Like parsnips, they are best when used early, as they tend to become hard and woody and rather strong in flavour when mature. The composition of carrots is practically the same as of beets, grown under similar conditions. They are richer in fat and fibre and with a lower percentage of sugar. They contain 6–7 per cent, of sugar, though the amount is rather variable, depending on maturity, etc.

Parsnips (*Pastinacea sativa*) are closely allied to carrots, and resemble them in properties, appearance, general manner of growth, and soil requirements. They have a much stronger flavour than carrots.

They are richer than beets or carrots in carbohydrates. They are also richer in fat. They contain, however, a larger quantity of crude fibre, so that they show a greater tendency to become hard and stringy if left too long.

Radishes (*Raphanus sativus*).—Those most commonly grown in South Africa are of the small oval or globes varieties, mild in flavour and pink or scarlet in colour, with white flesh.

Radishes are generally used as soon as possible after picking, otherwise fermentation sets in, which changes part of their starch into sugar, so that they become sweetish and lose their flavour and also tend to get flabby and soft.

They are generally eaten raw while still young and immature, as they tend to get pungent and disagreeable in flavour on approaching maturity.

In this young state they contain a higher percentage of water than beets or carrots, generally over 90 per cent., and are very succulent.

Their percentage of protein is very low—lower than beets or carrots—and they are lower than carrots in fat, while their percentage of carbohydrate is also lower, so that all round they have very little food value and are valuable mainly for their flavour and succulence.

Turnips.—The turnips grown in South Africa are mostly of table varieties—spherical shaped and white fleshed. Their flavour makes them also a valuable addition to the diet.

Turnips used as vegetables contain about 90 per cent. of water, so that their nutritive value is not high.

Their principal food value lies in their carbohydrate, amounting to about 6 per cent., and consisting largely of cane sugar, glucose, etc. They are very poor in proteid and fat. In turnips and radishes also, in the state in which they are used as vegetables, only a small percentage of the crude proteid exists as true protein or flesh-forming material.

Bulb-producing Plants.—Of bulb-producing plants, the most important is the onion. All members of this group of plants have a strong odour and flavour. This flavour, as is also true of the plants belonging to the order *Cruciferæ*, is due to volatile organic compounds of sulphur, which are decomposed by heat and are consequently largely lost in cooking. So that cooked onions, like cooked turnips, etc., have a much milder flavour than the raw vegetables. The total crop of onions produced in South Africa is very considerable, and many farmers who are in a convenient position for markets put in large areas. For satisfactory storage the plants must be mature, though for market purposes and immediate use younger bulbs are preferable, as they contain smaller percentages of fibre in this condition.

They generally contain about 85 per cent. of water. They are poor in ash, but in protein they compare favourably with the succulent roots, while their carbohydrate content also compares favourably with root crops.

Shallots are also grown to some extent for seasoning.

Leeks, of which several varieties are grown, are valuable for their leaves, which are used as a green vegetable in soups, etc. These vegetables are closely related to onions, and are valued for similar properties.

Garlic is also closely related to the onion. It is not used here to any extent except by people of South European descent, as is shown rather forcibly by their breath.

PLANTS USED FOR THEIR INFLORESCENCES.

Cauliflower is a variety of cabbage in which the edible portion is the modified and much thickened flower head. It is very largely

cultivated and is a most delicious vegetable. Many different varieties are produced, differing in size, earliness, firmness of the heads, vigour of growth, and table qualities, but these differences are largely due to cultivation.

Its chemical composition does not differ very largely from that of the common cabbage. The edible portion contains more carbohydrate and fat, but less fibre and ash. In respect of proteid they are very similar.

Globe Artichokes (Cynara scolymus) is not yet very generally grown as a vegetable in South Africa. For edible purposes the flower buds are used before they are open. While the artichoke is still young and tender it is sometimes used in the raw state. The plant tends here, however, to get hard very quickly, and it has then to be cooked before use. It is grown here either in autumn or spring in well-worked manure land. The stem is generally cut off close to the leaves, and the parts of the flower in the centre and the hard outer leaves are removed before use.

PLANTS USED FOR THEIR LEAVES, SHOOTS, OR STALKS.

Cabbage (Brassica oleracea), of which many different varieties are grown, differing in earliness, solidity, and shape of head, crispness, and flavour.

The cabbage contains generally about 90 per cent. of water. Its fibre content is rather higher than in the succulent roots, but in ash and protein it compares favourably with those root crops.

Brussels Sprouts is a variety of cabbage also grown to some extent. It is generally sown early and transplanted before winter. The composition of brussels sprouts is very similar to that of cabbage, but its fibre content is lower, and it is a much more delicious vegetable than ordinary cabbage.

Lettuce (Lactuca sativa).—Of this vegetable many different varieties are cultivated. It is a very succulent vegetable in the condition in which it is used, and with a very delicate flavour.

Its food value, however, is very low, containing, as it may do, up to 93 per cent. of water. Compared with cabbage it is lower in carbohydrates, but almost equal to cabbage and the succulent roots in proteid.

Asparagus (Asparagus officinalis).—This vegetable is generally used in the young state, and in this condition contains high percentages of water—92–94 per cent. It is lower than other vegetables in ash, fibre, and carbohydrates, but its proteid content is about normal when compared with other succulent vegetables.

Legumes in general use as vegetables are principally beans and peas.

The garden beans generally used fall into two distinct classes—bush and climbing beans.

Each of these general classes may be divided into kidney beans (*Phaseolus vulgaris*) and lima beans (*Phaseolus lunatus*).

Kidney beans are either green podded or butter beans wax podded.

The characteristics of lima beans vary considerably in the habit and growth of the plants and characters of the seed. The types and varieties vary with the purpose for which the beans are grown, as snap beans for early use, for which purpose early growing varieties of green or wax-podded kidney beans are used.

The different varieties of kidney beans vary considerably in earliness, productiveness, tenderness, flavour, and texture of the pods. Some varieties have the pod tough and are not suited to eating in the green condition as snap beans except when very young. These snap beans are generally grown by market gardeners to secure a succession of pickings throughout the season.

Lima beans (role lima beans) are not very common, but there are several varieties of dwarf limas grown in a similar manner to kidney beans. They are valuable as summer vegetables, producing big crops of green beans which have a more delicate flavour than common beans. In the dry state, also, they can be used in practically the same manner as common beans, so that lima beans are of great commercial value as a table vegetable.

Snap beans contain a high percentage of water (80 per cent.), so that they are valuable mainly for their succulent quality, though their proteid content is higher than that in any of the succulent vegetables.

In shelled beans, and especially in the dry beans, the proteid content is high, about 25 per cent., and over 50 per cent. carbohydrate starch, so that they could well replace part of the nitrogen-supplying foodstuffs in the diet—i.e. flesh, etc. Their principal drawback from the food point of view is their comparatively low fat content compared with the other constituents.

Peas are quite as highly valued as beans for human consumption. They are not generally eaten in the pod.

Many different varieties are in use, varying in earliness, productiveness, habit of growth, quality, and flavour. Like beans, they are rich in nitrogenous flesh-building material, richer than any of the roots or tubers, and have a higher food value than those.

Green peas contain about 75 per cent. of water, about 13–14 per cent. of starch and sugar, and are about three times as rich in proteid as any of the root crops.

Green Mealies, when eaten in the unripe state, are very succulent, and when cooked form a very palatable vegetable, much relished in South Africa. In the state in which they are picked they yield slightly more food material than potatoes, but much less than foods like peas or cereal foods. When picked in this condition, however, they are valued more for their palatability than for their actual food value. They contain about 75 per cent. water.

They are richer than potatoes in proteid and fat, contain about the same amount of carbohydrate, starch, and sugar, but are poorer than potatoes in mineral matter. Like potatoes, they contain too little proteid in proportion to their fat and carbohydrates to supply the body with nutritive materials in their proportions.

Dry shelled mealies are also used in the cooked condition for vegetables in South Africa, as is also shelled rice. These are both poor in proteid flesh-forming materials and also in fat, though in these respects mealies are richer than rice. Both are typical starchy foods, and must be combined with foods rich in nitrogen and fat to form an economical diet.

Mealies when eaten in the unripe condition contain more nitrogenous flesh-building material in proportion to their other food constituents than when used in the ripe shelled condition.

Pumpkins are used to a considerable extent as vegetables, etc., in South Africa, and largely as a cattle feed. They are very productive and of high value both for table and stock food, and have good keeping qualities.

There is a considerable variation in composition between the finer garden varieties used for the table and the coarser, larger-growing cattle types.

The garden grown varieties show generally thicker, finer grained flesh with less moisture than the field grown samples, which are larger, with coarser flesh and tending to woodiness. All round they are of poorer quality, and may be compared as follows :—

	Garden Variety.	Field Variety.
Moisture	89·0	91·0
Ash	·6	·5
Protein matter	1·7	1·2
Fibre	1·7	1·8
Oil	·7	·4
Carbohydrates as starch and sugar..	6·6	5·1

It will thus be seen that the coarser growing cattle pumpkins are poorer feeding all round than the finer growing garden types.

Squashes are very similar to pumpkins, and there are many varieties. They are, however, generally better fitted for table use

than for stock feed. Squashes are more nutritive than pumpkins, as they contain less water. They are higher in feeding value than even the garden varieties of pumpkins, but this is due primarily to their lower water content.

	Per cent.
Moisture	88
Ash	·8
Protein	1·9
Fibre	1·6
Oil	·72
Carbohydrates as starch and sugar	8·31

Cucumbers are largely cultivated in South Africa. They are used generally as salad while still young. In this state they contain a high percentage of water—up to 95 per cent.

They show about the following composition :—

	Per cent.
Moisture	95·38
Ash	·4
Protein	·87
Fibre	·71
Oil	·16
Carbohydrate, starch and sugar	7·87

Water Melons are grown in practically the same way as pumpkins, and, like all plants belonging to the *Cucurbitaceæ*, require rich, warm, and well-drained soil. Though melons often grow to a large size, those of an average size, with firm flesh and good keeping qualities, are preferable, in addition to their standing more rough handling. The water melon as used contains :—

	Per cent.
Moisture	92
Ash	·31
Protein	·43
Oil	·2
Fibre	·55
Carbohydrate, starch and sugar	6·51

The *Mush Melon*, of which there are also a number of good varieties, does not grow to such a size as the water melon, but, compared with the water melon, it contains more nutrient matter, due to the fact that it contains less water.

As used, the average composition is about :—

	Per cent
Moisture	90
Ash	·6
Protein	·64
Fibre	·78
Oil	·2
Carbohydrates, starch and sugar	7·77

It is therefore considerably higher in feeding value than the water melon.

The *Egg Plant* is also highly valued as a vegetable. It has, however, little nutriment value. It contains about :—

	Per cent.
Moisture	92·5
Ash	·5
Protein	1·37
Fibre	·85
Oil	·18
Carbohydrates as starch and sugar	4·6

Tomatoes, although they do not contain very much nutrient material, are yet one of the most useful and most appreciated vegetables we have.

As tomatoes are used here mostly locally, they are generally allowed to ripen on the vines before picking.

They contain mostly :—

	Per cent.
Water	93·5
Ash	5·7
Protein	1·16
Fibre	·91
Oil	·28
Carbohydrates, starch and sugar	3·58

It can thus be seen that their food value is very low, but, like all succulent vegetables, they have a value far beyond their value calculated as mere nutrient material in their promotion of general health and in the variety they afford at table.

NOTICES.

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